FORM PTO-1390 (REV. 11-2000) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: VMF-493-A

US APPLICATION NO. (If known, see 37 CFR 1.5): Unknown 09/890734

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FR00/00269	04 February 2000	05 February 1999

TITLE OF INVENTION: IMPROVEMENTS TO DIRECT CURRENT ELECTRIC MOTORS, IN PARTICULAR FOR MOTOR VEHICLE ACTUATORS

APPLICANT(S) FOR DO/EO/US: Jean-Louis Delevallee

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [XX] is attached hereto (required only if not communicated by the International Bureau).
   b. [ ] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [X] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made: however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [X] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [X] Other items or information: Red-Lined Specification

JC17 Rec'd PCT/PTO 02 AUG 2001

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
Unknown 09/890734	PCT/FR00/00269	VMF-493-A

21. ☒ The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1000.00		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $860.00		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $710.00		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) $690.00		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 0	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	16 - 20 =		x $18.00	$	
Independent claims	1 - 3 =		x $80.00	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $270.00	$	
TOTAL OF ABOVE CALCULATIONS =				$ 860	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+	$ 0	
SUBTOTAL =				$ 860	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$ 0	
TOTAL NATIONAL FEE =				$ 860	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$ 40	
TOTAL FEES ENCLOSED =				$ 900	
				Amount to be refunded:	$
				charged:	$

a. ☒ A check in the amount of $ 900.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 25-0115. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

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Attorney's Docket: VMF-493-A
Box PATENT APPLICATION
Assistant Commissioner of Patents
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EXPRESS MAIL LABEL NO.:
EL845187735US

Sir:

Enclosed please find a national stage application for U.S. Patent under 35 CFR §371 as identified below.

Inventor: Jean-Louis Delevallee
Invention: **IMPROVEMENTS TO DIRECT CURRENT ELECTRIC MOTORS, IN PARTICULAR FOR MOTOR VEHICLE ACTUATORS**

and including: Postcard; Transmittal Letter; Preliminary Amendment; Substitute Specification; 2 sheet of drawing; Combined Declaration and Power of Attorney; Red-line Specification; English Language Translation; Copy of the International Application; Information Disclosure Statement including Form PTO-1449 and the cited references; Recordation Form Cover Sheet; Assignment

National Filing Fee:	$860.00
Recordation Fee:	$ 40.00
Total	$900.00

Please charge any deficiency or credit any excess in the enclosed fees to Deposit Account No. 25-0115.

[X] **If checked, Applicant will not be filing foreign applications on the invention in countries that publish on an 18-month date, the Applicant requests that the application not be published.**

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Our Reference: VMF-493-A PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Jean-Louis Delevallee
Serial Number:	Unknown
Filing Date:	Concurrent
Examiner/Art Group Unit:	Unknown/Unknown
Title:	IMPROVEMENTS TO DIRECT CURRENT ELECTRIC MOTORS, IN PARTICULAR FOR MOTOR VEHICLE ACTUATORS

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington D.C. 20231

Sir:

Entry of this Preliminary Amendment before the calculation of the filing fee and examination of the above identified application is respectfully requested.

In the specification:

After the claims, start a new page and insert:

ABSTRACT

An electric motor for motor vehicle actuators include a rotor provided with a coil having first and second radial ends and rotatingly mounted in a hollow frame of two parts directly mounted on each other and having end walls, the two parts are made of good heat conducting material. The frame bears an inductor. The frame is sealed, and the two parts are two components transversely assembled one on the other, and the end wall of each part is continuously adjacent to one of the first and second ends of the coil.

In the claims:

Cancel claims 1-15 and substitute therefore:

16. An electric motor including a rotor provided with a coil having a first and second radial ends, and mounted rotatingly in a hollow frame formed of two parts directly mounted on each other and having end walls, the two parts being made of a heat conducting material, the frame carrying induction means, characterized in that the frame is sealed, and the two parts are two components transversally assembled one on each other, and the end wall of each part is continuously adjacent to one of the first and second ends of the coil.

17. The motor according to claim 16, characterized by the end walls enveloping nearer the ends of the coil in the shape of buns.

18. The motor according to claim 17, characterized by the end walls of the two pieces are centrally bowl shaped.

19. The motor according to claim 16, characterized by the material of the two parts being non-magnetic.

20. The motor according to claim 19 characterized by the material being chosen as one of "zamac", aluminum, magnesium.

21. The motor according to claim 16, characterized by the material of the two parts being one of magnetic or magnetizable material.

22. The motor according to claim 16, characterized by one of the two pieces of the frame being made up of one piece with at least one part of a piece of a gear box casing of an actuator to which the motor corresponds.

23. The motor according to claim 16, characterized by at least one of the two pieces of the frame including an end wall and a radial orientation portion on its exterior elements that contributes to the increase of the thermal changes with the ambient air.

24. The motor according to claim 23, characterized by the radial orientation portion carrying cooling fins.

25. The motor according to claim 23, characterized by the portion carrying fixation lugs.

26. The motor according to claim 16, characterized by both of the two pieces of the frame including an end wall and a radial orientation portion.

27. The motor according to claim 16, characterized by each piece having an assembly flange of pieces between them.

28. The motor according to claim 27 characterized by at least one of the flanges is interrupted by at least a fixation lug.

29. The motor according to claim 16, characterized by one of the two pieces of the frame being a closing plate on which the other piece is attached.

30. The motor according to claim 16, characterized by a plate carrying charcoal placed at the interior of the frame on the end wall of one of the two pieces.

31. The motor according to claim 16, characterized by the two pieces being made of different materials.

REMARKS

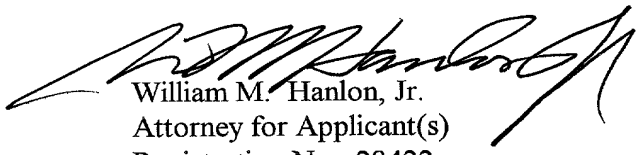
Upon entry of this amendment claims 1-15 are canceled and new claims 16-31 have been added therefore. An abstract has been added.

A hand-written, corrected copy of the specification is enclosed showing the changes which have been made to the specification as required by Section 608.01(Q) and 714.20(1) of the Manual of Patent Examining Procedure. The Substitute Specification filed herewith has been amended to utilize idiomatic English, correct minor typographical and grammatical errors and to conform the application to current United States patent practice. The Substitute Specification includes no new subject matter; but does include the same changes handwritten in red in the attached, corrected, original specification. Entry of the Substitute Specification is respectfully requested.

It is submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Consideration of the application as amended is requested.

Respectfully submitted,

YOUNG, BASILE, HANLON, MacFARLANE, WOOD & HELMHOLDT, P.C.



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Dated: August 2, 2001
WMH/jao

SUBSTITUTE SPECIFICATION

VMF-493-A PATENT

IMPROVEMENTS TO DIRECT CURRENT ELECTRIC MOTORS, IN PARTICULAR, TO MOTOR VEHICLE ACTUATORS

BACKGROUND

[0001] The present invention concerns electric motors for electric motors used in the motor vehicle actuator.

[0002] The invention advantageously finds use in closed electric motors that dissipate heat energy, such as wiper motors, clutch controls, the windshields of motor vehicles, electric control motors sunroofs or of seats. The invention applies to electric motors of the synchronous type, asynchronous types, or others.

[0003] Classically, the stator of an electric motor with direct current comprises a steel frame which serves to support the magnets, which assures the seal of the motor, allowing one to close the magnetic flux and assures a good removal of the heat generated in the inductor via conduction, convection and radiation.

[0004] In certain applications, it is desirable to have at one's disposal very small electric motors, allowing higher rotational speeds and transmitting significant engine torque, for the wiping and the control of the wiping of a vehicle.

[0005] In order to do this, one knows, in document FR-2.432.790, electric motor structures in which the frame of the stator is in a non-magnetizable material, such as "zamac", and carries a soft-iron ring-shaped element that allows the flux of the magnetic field to close.

[0006] This frame is made of up two half boxes closed onto each other according to a contact plane what passes by the axis of the motor. These half boxes present openings in which the stator magnets are received, such that the said frame is not at all sealed and the motor is well ventilated.

[0007] A technical problem encountered while one seeks to create compact and water- and dust-proof electric motors is that of the evacuation of the heat dissipated by the inductor because, while one tries to diminish the size of the motor,

one must increase the rotational speed in order to transmit an equivalent engine torque, while leads to an increase of the heat to emit.

SUMMARY

[0008] The goal of the invention is to resolve this problem in a simple and economic manner by improving the thermal exchanges.

[0009] The invention proposes such an electric motor, to be used in a motor vehicle, comprises a rotor provided with a coil having first and second radial ends, and mounted in rotating in a hollow frame formed of two hollow parts directly mounted on each other and having end walls, the two parts being made of good heat conducting material and the frame bearing induction means, characterized by the frame is sealed, and by the two parts being two pieces assembled transversally one onto the other, and by the end wall of each part being continuously adjacent to one of the first and second ends of the coil.

[0010] In these conditions, the radiation and thermal convection of the ends of the coil are directly transmitted to the end walls and evacuated in the optimal method.

[0011] In addition, the plane of the joint or the assembly of the two pieces is implanted outside of the bearings supporting the motor axis in such a way that the bearings are carefully arranged. Also, the two pieces are not necessarily the same, for example, one of the pieces can have a thickness considerably greater than the other. However, the assembly plane of the two pieces can be a simple sturdier flange.

[0012] Thanks to transversal mounting of the pieces of the frame, direct access to the parts making up the motor is facilitated by removing one of the pieces of the frame.

[0013] Such a motor is advantageously completed by the different following characteristics taken individually or according to all of their possible combinations:

[0014] the walls of the end envelope roughly in the shape of buns, made up from the ends of the coil, in order to still prefer the thermal exchanges;

[0015] the interior surfaces of the end walls of the two pieces of the frame are centrally shaped with a bowl shape that limits the ends of the rotor coil that are adjacent to the walls;

[0016] the heat conducting material is not magnetic and advantageously chosen from the group containing "zamac," aluminum, magnesium, in order to reduce the weight of the motor and to facilitate its creation via casting.

[0017] variably, the material is magnetic or magnetizable, such as steel;

[0018] one of the two pieces of the frame is a piece with at least one part gear box casing of the actuator to which the said motor corresponds;

[0019] at least one of the two pieces of the frame comprises an end of the wall and an radial orientation portion that contains on the outside elements that contribute to the increase in thermal changes with ambient air;

[0020] at least one of the two pieces of the frame comprises cooling fins;

[0021] at least one of the two pieces of the frame comprises fixation lugs that facilitate the thermal changes via conduction and the dismantling of the piece devoid of the fixation lugs;

[0022] at least one or the other of the two pieces of the frame comprises a wall end and circumferential part;

[0023] the two pieces are in different materials.

BRIEF DESCRIPTION OF THE DRAWING

[0024] Other characteristics and advantages of the invention will be brought out in the following description. This description is purely illustrative and non-limiting. It must be read in regard to the attached drawings on which:

[0025] Fig. 1 is a schematic cut view illustrating one method of production;

[0026] Fig. 2 is a schematic cut view illustrating another method of production;

[0027] Fig. 3 is a perspective view of the production method of Fig 2;

[0028] Fig. 4 is schematic cut view illustrating another method of production of invention; and

[0029] Fig. 5 is a perspective view of the production method of Fig. 4.

DETAILED DESCRIPTION

[0030] The electric motor that is represented in Fig. 1 is a closed direct current electric motor, that comprises a hollow frame 1, as well as a coiled rotor 2 carried by a shaft 3 mounting rotating between two bearings 4, 5 mounted in the frame 1, made up of ball bearings in this method of production. The shaft 3 carries between these two

bearing 4, 5 a packet of coupled sheet metal 20, each having notches in the shape of a V in order to make up radial grooves 30. These grooves are designed to wrap around several conductor threads, here in copper, in order to form a coil 21. This coil thus has, projecting in relation to the packet 20, and at each of its ends, a first and second radial end, 22 and 23, in the shape of buns.

[0031] The frame 1 is a closed frame that is watertight and sealed to dust. It is made up of two pieces 6, 7 that are radially arranged one on the other, their contact and assembly plane being notably perpendicular to the axis of rotation X-X of the shaft 3.

[0032] These two pieces 6, 7 are hollow molded pieces in a light non-magnetic material in this method of production, and have good thermal conduction, such as aluminum, magnesium, "zamac", etc. Variably, these hollow pieces 6,7 are made of machined steel or another magnetic material or magnetizable material and a good heat conductor.

[0033] The two pieces 6,7 each have a ring-shaped portion with radial orientation 6a, 7a, the interior surface of which is of a cylindrical shape, and a bottom 6b, 7b, with transversal orientation, that ends the portion 6a, 7a at an end. The bottom 6b receives the bearing 4 that makes the rear bearing; and the bottom 7b is crossed by the shaft 3 and is prolonged by an overhang 16 that receives the front bearing 5, as well as the manifold 14 of the motor. It also has lodgings 15 for charcoal 15'.

[0034] The frame 1 carries a ring inductor 8 and magnets 9. In order to do this, the frame receives in its interior a tubular ring 8, that is, in a magnetic or magnetizable material, for example, soft iron.

[0035] The frame 1 also receives permanent bearing 9 that are placed on the interior of the tube 8 and the magnetic field of which surrounds the tube 8. A weak air-gap is placed between the packet of steel 20 and the magnets, allowing the increase of the motor's performance.

[0036] The tube 8 and the magnets 9 are held in place via a built-in in the frame 1 by interior holes 10 that have bottoms 6b, 7b and in which the edges of the tube 8 and the bearings 9 are received. This built-in allows, via cooperation, the shapes to free themselves from springs normally used for assembling the bearings of the tube. In addition, the replacement of these springs by the heat conducting material between the

holes 10 allows the more efficient removal of heat because the coil of the conductor thread in the grooves 30 are adjacent to this material that advantageously reaches radially from one bottom 6b to the other 7b.

[0037] The bottoms 6b, 7b, each transversally making up an end wall for the piece 6, 7, respectively, also having an interior with a bowl shape that envelopes the radial ends 22, 23 of the coil 21 of the rotor 2. These ends 21, 22 are according to the invention, continually adjacent to the bottoms 6b, 7b, which allows the minimization of the space between these bottoms 6b, 7b and the ends 22, 23. As a consequence, the radiation energy by the ends 22, 23 is transmitted over the entire frame and removed in an optimized manner.

[0038] As one already knows, the structure that was just described allows the use of good heat conducting materials in order to create a sealed frame, specifically to water and dust, of a compact electric motor.

[0039] In addition, the bottoms 6b, 7b of the frame, making up end walls, have centrally the shape of a bowl in order to receive in a complementary manner the buns 2, 23 of the coil 21. This arrangement minimizes the distance between the coil and the frame 1, which allows the optimization of the cooling of the inductor by the frame 1.

[0040] One will also note that "zamac", aluminum, or magnesium allows a gain of mass.

[0041] In addition, the structure described allows the casting of one of the two pieces 6, 7, that make up the frame 1 – and specifically that which defines the front bearing of the motor – in such a way that it is a piece with at least one gear box casing part 16 of the actuator to which the motor is associated. Also, the piece that is cast in one piece with at least one gearbox casing part can be in a different material, with a similar magnetic nature or different in relation to the other piece.

[0042] The result is a simplification of mounting, as well as an increase in volume of the frame 1 which contributes to the increase the thermal changes with the ambient air.

[0043] In the example illustrated in Fig. 1, the piece 6 has more than one fixation lug 13 that, other than their mechanical function, also allows the augmentation of the volume of the frame 1 and thus the thermal changes via convection and radiation with

the ambient air and via conduction with the support on which the lugs are attached. In addition, the fact that the fixation lugs are placed to the right of the steel packet 20 allows the diminishing the chance of being unbalanced and thus to improve the holding of the rotor 2.

[0044] Variably or as a complement, it can also be planned that at least one of the two pieces 6 and 7 carry cooling fins.

[0045] This is what is illustrated in Figs. 2 and 3, on which one has represented a production variance in which the circumferential part 6a of the piece 6 comprises more than one cooling fin 11 that reaches the length of the generators of this part 6a, each in a plane diametrical to the piece 6. More specifically on Fig. 2, it appears that pieces 6 and 7 are joined via flanges 31, 32 of which one 32 is interrupted by the fixation lugs 13. The flanges are assembled together via fixation systems, such as screws, rivets or others known to those in this profession.

[0046] Other production variations of the invention are also very possible. For example, the two pieces of the frame carry fixation lugs and cooling fins. Each piece can contain at least one fixation lug interrupting the corresponding flange.

[0047] These two pieces can have different thicknesses as a result of the applications designed. Specifically, as is illustrated in Figs. 4 and 5, the piece 7 can be made up of one simple closing plate on which comes to relate to the hollow part 6.

[0048] Also, the plate carries charcoal (not represented in Figs. 1 to 5) can be placed on the interior of the frame 1 on the bottom 7b of the piece 7. The heat freed by the plate 7are also directly removed by the plate 7.

[0049] The shaft 3 has an end fitted in order to allow the creation of the input element of the actuator. For example, as is illustrated in a schematic manner on Fig. 4, the shaft 3 has a threaded end 33 in order to guide a nut or a wheel belonging to a engaging device, such as is described in documents EP 0 740 401 and EP 0 897 629.

[0050] However, in order to obtain thermal changes even more efficiently between the inductor and the rest of the motor, specifically while the conductor thread is of a bigger diameter so that the motor can furnish a larger couple motor, it is advantageous that the coils and the buns are nearer to the frame. In order to do this, without de-standardizing the notches of the steel packet, the bottoms of the notches are

filled with a plastic material, or any other electrically and thermally isolating material, so that the thread coils occupy all of the space in the top of the grooves and thus radiation towards the frame and/or the ring. Variably, it is also possible to produce specific less deep notches.

What is claimed is:

1. Electric motor, notably for the actuator of the motor vehicle, comprising a rotor (2) provided with a coil (21), having a first (22) and second (23) radial ends, and mounted rotating in a hollow frame (1) comprising two parts (6, 7) directly mounted on each other and having end walls (6b, 7b), two parts being made of good heat conducting material and said frame bearing induction means (8, 9), characterized by in that said frame (1) is sealed, and the two parts are two components (6, 7) transversally assembled one on each other, and the end wall (6b, 7b) of each part is continuously adjacent to one of said first and second ends (22, 23) of the coil (21).

2. Motor according to claim 1, characterized by the end walls (6b, 7b) enveloping nearer the ends of the coil (21) in the shape of buns.

3. Motor according to claim 2, characterized by the end walls (6b, 7b) of the two pieces (6, 7) are centrally *bowl shaped.

4. Motor according to one of the preceding claims, characterized by the material being non-magnetic and chosen in the group comprising "zamac", aluminum, magnesium.

5. Motor according to claims 1 to 3, characterized by the material being magnetic or magnetizable, such as steel.

6. Motor according to one of the preceding claims, characterized by one (7) of the two pieces of the frame (1) is made up of one piece with at least one part of a piece of gear box casing of the actuator to which the said motor corresponds.

7. Motor according to one of the preceding claims, characterized by at least one (6) of the two pieces (6, 7) of the frame (1) comprising an end wall (6b) and a radial orientation portion (6a) that contains on its exterior elements (11, 13) that contribute to the increase of the thermal changes with the ambient air.

8. Motor according to claim 7, characterized by the radial orientation portion (6a) carrying the cooling fins (11).

9. Motor according to one of claims 6 and 7, characterized by the said portion (6a) carrying fixation lugs (13).

10. Motor according to one of the preceding claims, characterized by both of the two pieces (6, 7) of the frame (1) comprising an end wall (6b, 7b) and a radial orientation portion (6a, 7a).

11. Motor according to any of the preceding claims, characterized by each piece (6, 7) having an assembly flange of pieces between them.

12. Motor according to claim 11 taken in combination with claim 9, characterized by at least one of the flanges is interrupted by at least a fixation lug (13).

13. Motor according to one of claims 1 to 12, characterized by one (7) of the two pieces of the frame (1) being a closing plate on which the other piece is attached.

14. Motor according to one of the preceding claims, characterized by comprising a plate carrying charcoal placed at the interior of the frame on the end wall of one of the two pieces.

15. Motor according to any of the preceding claims, characterized by the two pieces being in different materials.

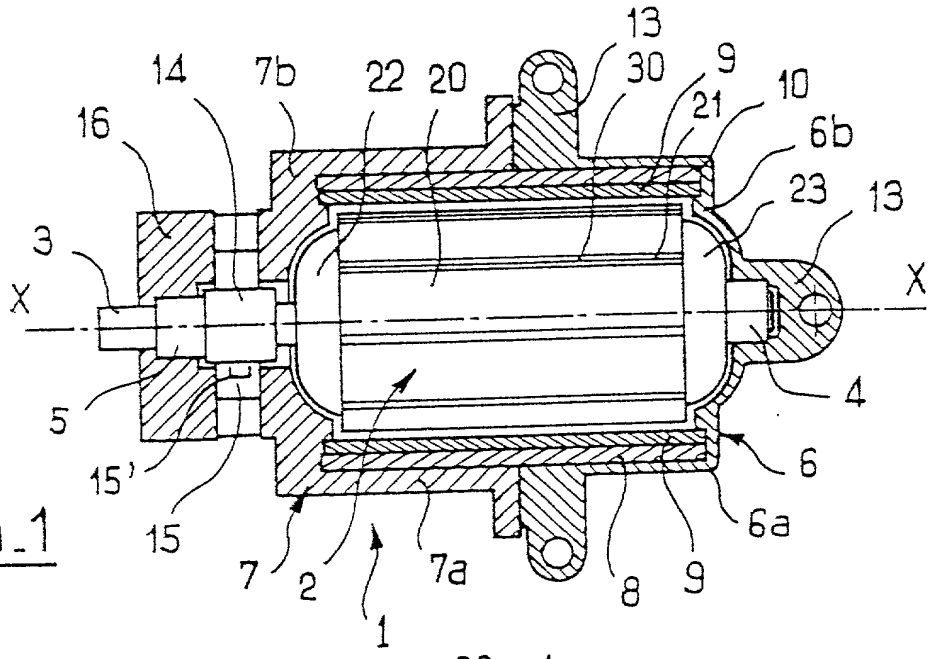

FIG_1

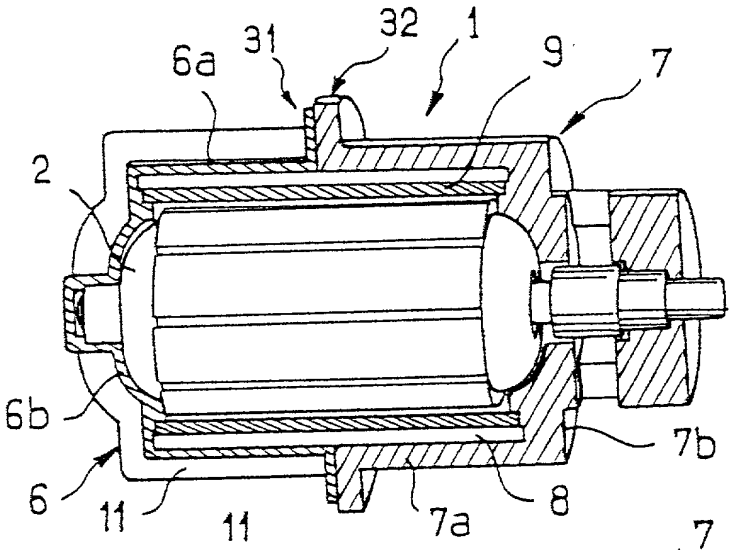

FIG_2

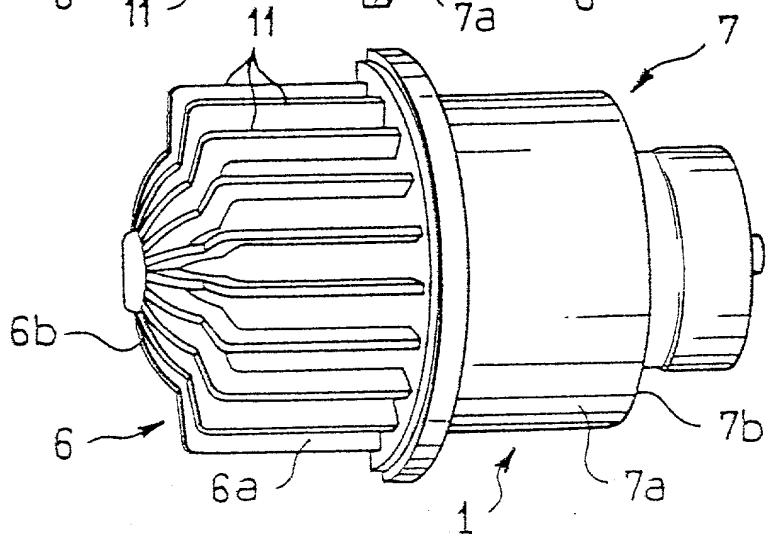

FIG_3

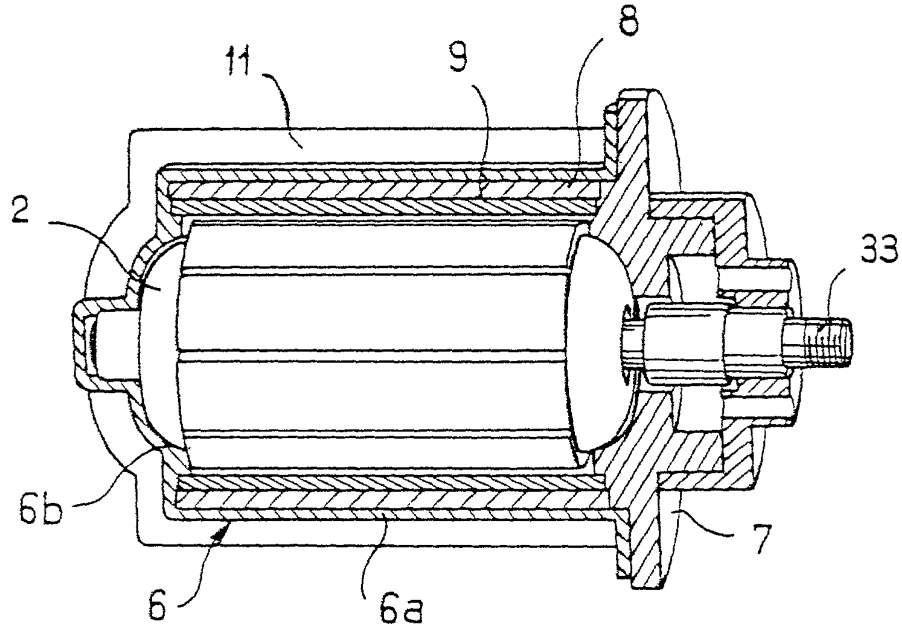

FIG_4

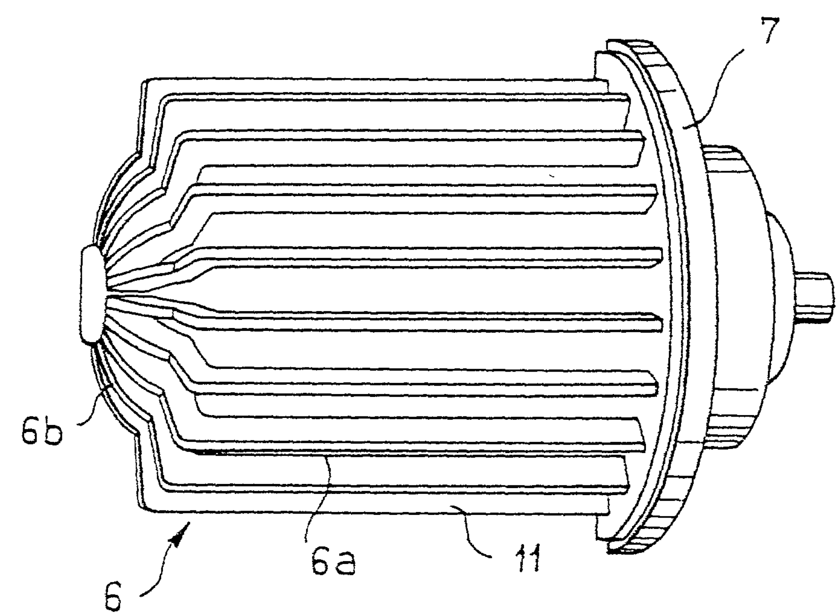

FIG_5

IMPROVEMENTS TO DIRECT CURRENT ELECTRIC MOTORS, IN PARTICULAR, TO MOTOR VEHICLE ACTUATORS

VMF-493-A

BACKGROUND

The present invention concerns electric motors for electric motors used in the motor vehicle actuator.

The invention advantageously finds use in closed electric motors that dissipate the calorific heat energy, such as wiper motors, clutch controls, the windshields of motor vehicles, electric control motors sunroofs or of seats. The invention applies to electric motors of the synchronous type, asynchronous types, or others.

Classically, the stator of an electric motor with direct current comprises a steel frame which serves to support the magnets, which assures the seal of the motor, allowing one to close the magnetic flux and assures a good removal of the calories heat generated in the inductor via conduction, convection and radiation.

In certain applications, it is desirable to have at one's disposal very small electric motors, allowing higher rotational speeds and transmitting significant engine torque, for the wiping and the control of the wiping of a vehicle.

In order to do this, one knows, in document FR-2.432.790, electric motor structures in which the frame of the stator is in a non-magnetizable material, such as "zamac", and carries a soft-iron ring-shaped element that allows the flux of the magnetic field to close.

This frame is made of up two half boxes closed onto each other according to a contact plane what passes by the axis of the motor. These half boxes present openings in which the stator magnets are received, such that the said frame is not at all sealed and the motor is well ventilated.

A technical problem encountered while one seeks to create compact and water- and dust-proof electric motors is that of the evacuation of the calories heat dissipated by the inductor because, while one tries to diminish the size of the motor, one must increase the rotational speed in order to transmit an equivalent engine torque, while leads to an increase of the heat to emit.

SUMMARY

The goal of the invention is to resolve this problem in a simple and economic manner by improving the thermal exchanges.

The invention proposes such an electric motor, to be used in a motor vehicle, comprises a rotor provided with a coil having first and second radial ends, and mounted in rotating in a hollow frame comprising two hollow parts directly mounted on each other and having end walls, said two parts being made of good heat conducting material and said frame bearing induction means, characterized by the frame being sealed, and by the two parts being two pieces assembled transversally one onto the other, and by the end wall of each part being continuously adjacent to one of the said first and second ends of the coil.

In these conditions, the radiation and thermal convection of the ends of the coil are directly transmitted to the end walls and evacuated in the optimal method.

In addition, the plane of the joint or the assembly of the two pieces is implanted outside of the bearings supporting the motor axis in such a way that the bearings are carefully arranged. Also, the two pieces are not necessarily the same, for example one of the pieces can have a thickness considerably greater than the other. However, the assembly plane of the two pieces can be a simple sturdier flange.

Thanks to transversal mounting of the pieces of the frame, direct access to the parts making up the motor is facilitated by removing one of the pieces of the frame.

Such a motor is advantageously completed by the different following characteristics taken individually or according to all of their possible combinations:

- the walls of the end envelope roughly in the shape of buns, made up from the ends of the coil, in order to still prefer the thermal exchanges;
- the interior surfaces of the end walls of the two pieces of the frame are centrally shaped with a bowl shape that limits the ends of the rotor coil that are adjacent to the walls;
- the heat conducting material is not magnetic and advantageously chosen from the group containing "zamac," aluminum, magnesium, in order to reduce the weight of the motor and to facilitate its creation via casting.
- variably, the material is magnetic or magnetizable, such as steel;
- one of the two pieces of the frame is a piece with at least one part gear box casing of the actuator to which the said motor corresponds;

- at least one of the two pieces of the frame comprises an end of the wall and an radial orientation portion that contains on the outside elements that contribute to the increase in thermal changes with ambient air;
- at least one of the two pieces of the frame comprises cooling fins;
- at least one of the two pieces of the frame comprises fixation lugs that facilitate the thermal changes via conduction and the dismantling of the piece devoid of the fixation lugs;
- at least one or the other of the two pieces of the frame comprises a wall end and circumferential part;
- the two pieces are in different materials.

BRIEF DESCRIPTION OF THE DRAWING

Other characteristics and advantages of the invention will be brought out in the following description. This description is purely illustrative and non-limiting. It must be read in regard to the attached drawings on which:

- figure 1 is a schematic cut view illustrating one method of production;
- figure 2 is a schematic cut view illustrating another method of production;
- figure 3 is a perspective view of the production method of figure 2;
- figure 4 is schematic cut view illustrating another method of production of invention; and
- figure 5 is a perspective view of the production method of figure 4.

DETAILED DESCRIPTION

The electric motor that is represented on figure 1 is a closed direct current electric motor, that comprises a hollow frame 1, as well as a coiled rotor 2 carried by a shaft 3 mounting rotating between two bearings 4, 5 mounted in the frame 1, made up of ball bearings in this method of production. The shaft 3 carries between these two bearing 4, 5 a packet of coupled sheet metal 20, each having notches in the shape of a V in order to make up radial grooves 30. These grooves are designed to wrap around several conductor threads, here in copper, in order to form a coil 21. This coil thus has, projecting in relation to the packet 20, and at each of its ends, a first and second radial end, 22 and 23, in the shape of buns.

The frame 1 is a closed frame that is watertight and sealed to dust. It is made up of two pieces 6, 7 that are radially arranged one on the other, their contact and assembly plane being notably perpendicular to the axis of rotation X-X of the shaft 3.

These two pieces 6, 7 are hollow molded pieces in a light non-magnetic material in this method of production, and having good thermal conduction, such as aluminum, magnesium, "zamac", etc. Variably, these hollow are made of machined steel or another magnetic material or magnetizable material and a good heat conductor.

They each have a ring-shaped portion with radial orientation 6a, 7a, the interior surface of which is of a cylindrical shape, and a bottom 6b, 7b, with transversal orientation, that ends this portion 6a, 7a at an end. The bottom 6b receives the bearing 4 that makes the rear bearing; the bottom 7b is crossed by the shaft 3 and is prolonged by an overhang 16 that receives the front bearing 5, as well as the manifold 14 of the motor. It also has lodgings 15 for charcoal 15'.

The frame 1 carries a ring inductor 8 and magnets 9. In order to do this, it receives in its interior a tubular ring 8, that is in a magnetic or magnetizable material, for example soft iron.

It also receives permanent bearing 9 that are placed on the interior of the tube 8 and the magnetic field of which surrounds the tube 8. A weak air-gap is placed between the packet of steel 20 and the magnets, allowing the increase of the motor's performance.

The tube 8 and the magnets 9 are held in place via a built-in in the frame by interior holes 10 that have bottoms 6b, 7b and in which the edges of the tube 8 and the bearings 9 are received. This built-in allows, via cooperation, the shapes to free themselves from springs normally used for assembling the bearings of the tube. In addition, the replacement of these springs by the heat conducting material between the holes 10 allows the more efficient removal of the calories because the coil of the conductor thread in the grooves 30 are adjacent to this material that advantageously reaches radially from one bottom 6b to the other 7b.

The bottoms 6b, 7b, each transversally making up an end wall for the piece 6, 7, respectively, also having an interior with a bowl shape that envelopes the radial ends 22, 23 of the coil 21 of the rotor 2. These ends 21, 22 are according to the invention, continually adjacent to the bottoms 6b, 7b, which allows the minimization of the space between these bottoms 6b, 7b and the ends 22, 23. As a consequence,

the radiation energy by the ends 22, 23 is transmitted over the entire frame and removed in an optimized manner.

As one already knows, the structure that was just described allows the use of good heat conducting materials in order to create a sealed frame, specifically to water and dust, of a compact electric motor.

In addition, the bottoms 6b, 7b of the frame, making up end walls, have centrally the shape of a bowl in order to receive in a complementary manner the buns 2, 23 of the coil 21. This arrangement minimizes the distance between the coil and the frame 1, which allows the optimization of the cooling of the inductor by the frame 1.

One will also note that "zamac", aluminum, or magnesium allows a gain of mass.

In addition, the structure described allows the casting of one of the two pieces 6, 7, that make up the frame 1 – and specifically that which defines the front bearing of the motor – in such a way that it is a piece with at least one gear box casing part 16 of the actuator to which the motor is associated. Also, the piece that is cast in one piece with at least one gearbox casing part can be in a different material, with a similar magnetic nature or different in relation to the other piece.

The result is a simplification of mounting, as well as an increase in volume of the frame 1 which contributes to the increase the thermal changes with the ambient air.

In the example illustrated in Fig. 1, the piece 6 has more than one fixation lug 13 that, other than their mechanical function, also allows the augmentation of the volume of the frame 1 and thus the thermal changes via convection and radiation with the ambient air and via conduction with the support on which the lugs are attached. In addition, the fact that the fixation lugs are placed to the right of the steel packet 20 allows the diminishing the chance of being unbalanced and thus to improve the holding of the rotor 2.

Variably or as a complement, it can also be planned that at least one of the two pieces 6 and 7 carry cooling fins.

This is what is illustrated in figures 2 and 3, on which one has represented a production variance in which the circumferential part 6a of the piece 6 comprises more than one cooling fin 11 that reaches the length of the generators of this part 6a, each in a plane diametrical to the piece 6. More specifically on figure 2, it appears that pieces 6 and 7 are joined via flanges 31, 32 of which one 32 is interrupted by the fixation lugs 13. The flanges are assembled together via fixation systems, such as screws, rivets or others known to those in this profession.

Other production variations of the invention are also very possible. For example, the two pieces of the frame carry fixation lugs and cooling fins. Each piece can contain at least one fixation lug interrupting the corresponding flange.

These two pieces can have different thicknesses as a result of the applications designed. Specifically, as is illustrated on figures 4 and 5, the piece 7 can be made up of one simple closing plate on which comes to relate to the hollow part 6.

Also, the plate carries charcoal (not represented on figures 1 to 5) can be placed on the interior of the frame 1 on the bottom 7b of the piece 7. The calories freed by the plate are also directly removed by the piece 7.

The shaft 3 has an end fitted in order to allow the creation of the input element of the actuator. For example, as is illustrated in a schematic manner on figure 4, the shaft 3 has a threaded end 33 in order to guide a nut or a wheel belonging to a engaging device, such as is described in documents EP 0 740 401 and EP 0 897 629.

However, in order to obtain thermal changes even more efficient between the inductor and the rest of the motor, specifically while the conductor thread is of a bigger diameter so that the motor can furnish a larger couple motor, it is advantageous that the coils and the buns are nearer to the frame. In order to do this, without de-standardizing the notches of the steel packet, the bottoms of the notches are filled with a plastic material, or any other electrically and thermally isolating material, so that the thread coils occupy all of the space in the top of the grooves and thus radiation towards the frame and/or the ring. Variably, it is also possible to produce specific notches less deep.

What is claimed is: 7

CLAIMS

1. Electric motor, notably for the actuator of the motor vehicle, comprising a rotor (2) provided with a coil (21), having a first (22) and second (23) radial ends, and mounted rotating in a hollow frame (1) comprising two parts (6, 7) directly mounted on each other and having end walls (6b, 7b), two parts being made of good heat conducting material and said frame bearing induction means (8, 9), characterized by in that said frame (1) is sealed, and the two parts are two components (6, 7) transversally assembled one on each other, and the end wall (6b, 7b) of each part is continuously adjacent to one of said first and second ends (22, 23) of the coil (21).

2. Motor according to claim 1, characterized by the end walls (6b, 7b) enveloping nearer the ends of the coil (21) in the shape of buns.

3. Motor according to claim 2, characterized by the end walls (6b, 7b) of the two pieces (6, 7) are centrally *bowl shaped.

4. Motor according to one of the preceding claims, characterized by the material being non-magnetic and chosen in the group comprising "zamac", aluminum, magnesium.

5. Motor according to claims 1 to 3, characterized by the material being magnetic or magnetizable, such as steel.

6. Motor according to one of the preceding claims, characterized by one (7) of the two pieces of the frame (1) is made up of one piece with at least one part of a piece of gear box casing of the actuator to which the said motor corresponds.

7. Motor according to one of the preceding claims, characterized by at least one (6) of the two pieces (6, 7) of the frame (1) comprising an end wall (6b) and a radial orientation portion (6a) that contains on its exterior elements (11, 13) that contribute to the increase of the thermal changes with the ambient air.

8. Motor according to claim 7, characterized by the radial orientation portion (6a) carrying the cooling fins (11).

9. Motor according to one of claims 6 and 7, characterized by the said portion (6a) carrying fixation lugs (13).

10. Motor according to one of the preceding claims, characterized by both of the two pieces (6, 7) of

the frame (1) comprising an end wall (6b, 7b) and a radial orientation portion (6a, 7a).

11. Motor according to any of the preceding claims, characterized by each piece (6, 7) having an assembly flange of pieces between them.

12. Motor according to claim 11 taken in combination with claim 9, characterized by at least one of the flanges is interrupted by at least a fixation lug (13).

13. Motor according to one of claims 1 to 12, characterized by one (7) of the two pieces of the frame (1) being a closing plate on which the other piece is attached.

14. Motor according to one of the preceding claims, characterized by comprising a plate carrying charcoal placed at the interior of the frame on the end wall of one of the two pieces.

15. Motor according to any of the preceding claims, characterized by the two pieces being in different materials.

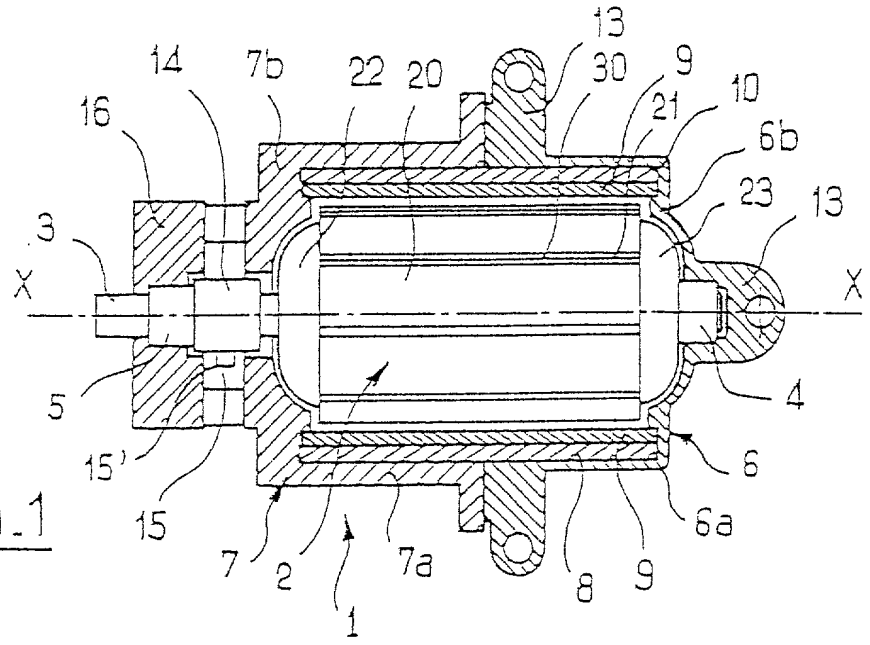

FIG_1

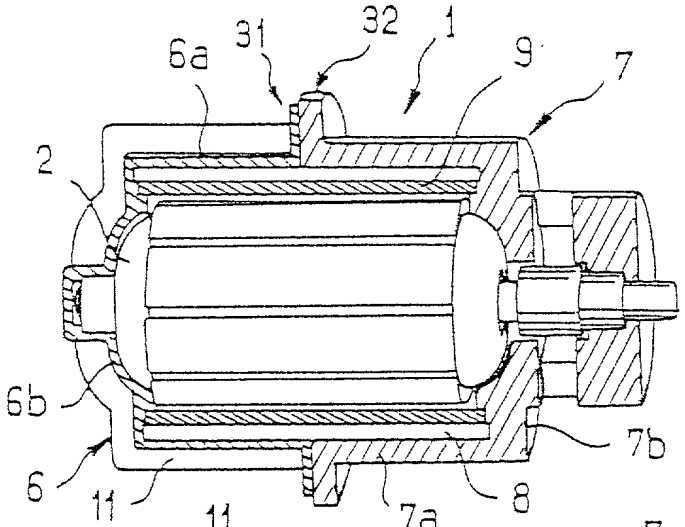

FIG_2

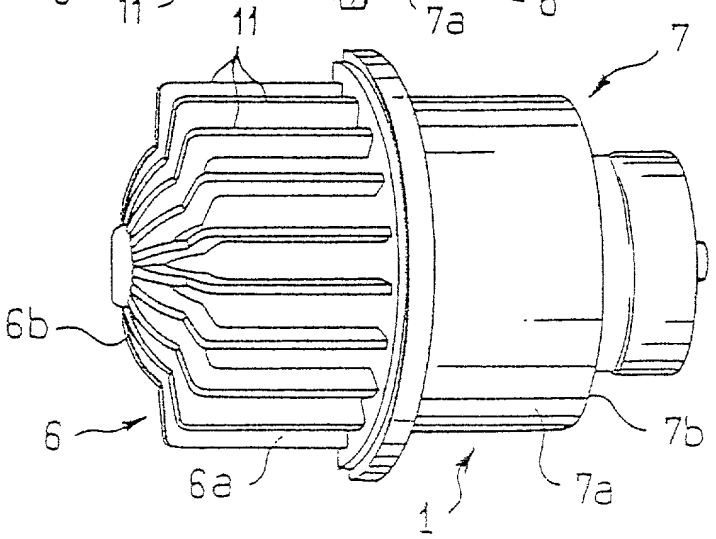

FIG_3

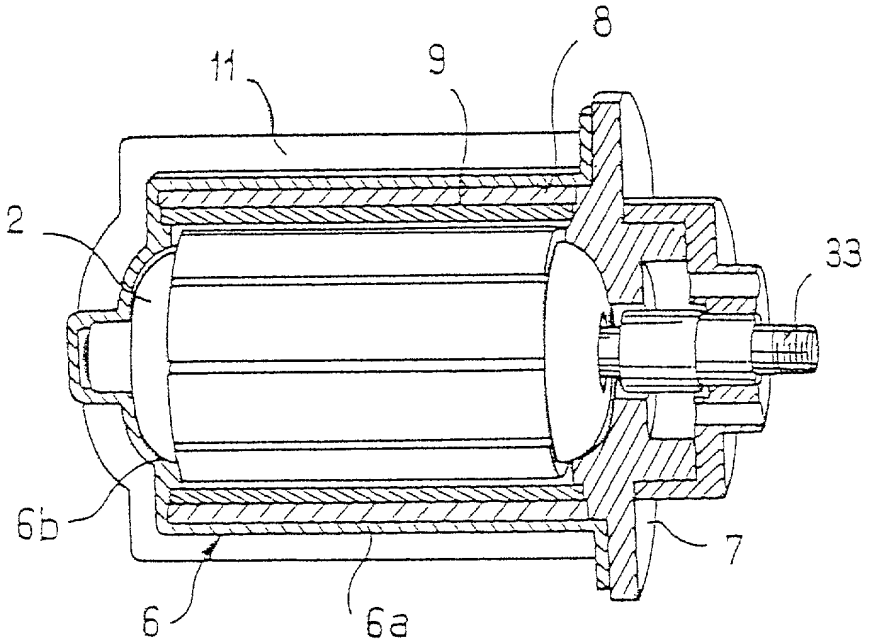

FIG_4

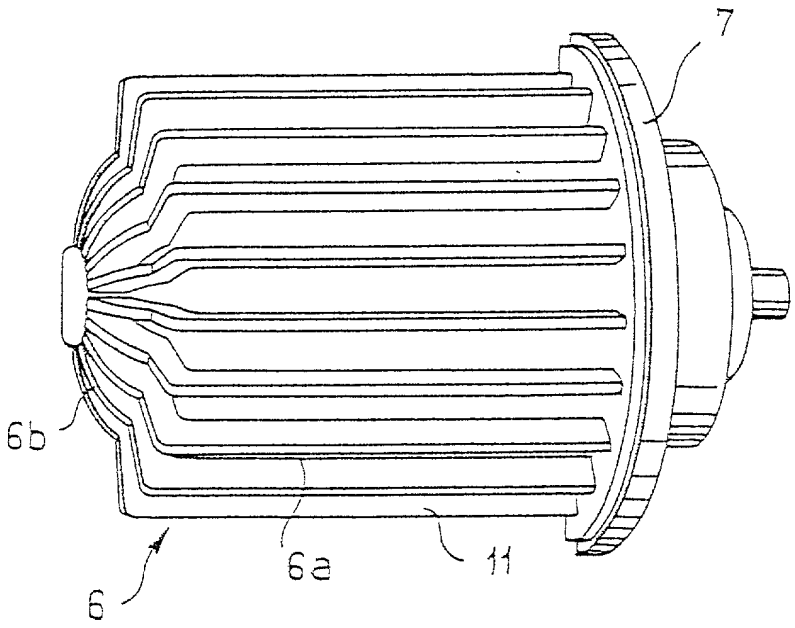

FIG_5

VMF-493-A

The present invention concerns electric motors for electric motors used in the motor vehicle actuator.

The invention advantageously finds use in closed electric motors that dissipate the calorific energy, such as wiper motors, clutch controls, the windshields of motor vehicles, electric control motors sunroofs or of seats. The invention applies to electric motors of the synchronous type, asynchronous types, or others.

Classically, the stator of an electric motor with direct current comprises a steel frame which serves to support the magnets, which assures the seal of the motor, allowing one to close the magnetic flux and assures a good removal of the calories generated in the inductor via conduction, convection and radiation.

In certain applications, it is desirable to have at one's disposal very small electric motors, allowing higher rotational speeds and transmitting significant engine torque, for the wiping and the control of the wiping of a vehicle.

In order to do this, one knows, in document FR-2.432.790, electric motor structures in which the frame of the stator is in a non-magnetizable material, such as "zamac", and carries a soft-iron ring-shaped element that allows the flux of the magnetic field to close.

This frame is made of up two half boxes closed onto each other according to a contact plane what passes by the axis of the motor. These half boxes present openings in which the stator magnets are received, such that the said frame is not at all sealed and the motor is well ventilated.

A technical problem encountered while one seeks to create compact and water- and dust-proof electric motors is that of the evacuation of the calories dissipated by the inductor because, while one tries to diminish the size of the motor, one must increase the rotational speed in order to transmit an equivalent engine torque, while leads to an increase of the heat to emit.

The goal of the invention is to resolve this problem in a simple and economic manner by improving the thermal exchanges.

The invention proposes such an electric motor, to be used in a motor vehicle, comprises a rotor provided with a coil having first and second radial ends, and mounted in rotating in a hollow frame comprising two hollow parts directly mounted on each other and having end walls, said two parts being made of good heat conducting material and said frame bearing induction means, characterized by the frame being sealed, and by the two parts being two pieces assembled transversally one onto the other, and by the end wall of each part being continuously adjacent to one of the said first and second ends of the coil.

In these conditions, the radiation and thermal convection of the ends of the coil are directly transmitted to the end walls and evacuated in the optimal method.

In addition, the plane of the joint or the assembly of the two pieces is implanted outside of the bearings supporting the motor axis in such a way that the bearings are carefully arranged. Also, the two pieces are not necessarily the same, for example one of the pieces can have a thickness considerably greater than the other. However, the assembly plane of the two pieces can be a simple sturdier flange.

Thanks to transversal mounting of the pieces of the frame, direct access to the parts making up the motor is facilitated by removing one of the pieces of the frame.

Such a motor is advantageously completed by the different following characteristics taken individually or according to all of their possible combinations:

- the walls of the end envelope roughly in the shape of buns, made up from the ends of the coil, in order to still prefer the thermal exchanges;
- the interior surfaces of the end walls of the two pieces of the frame are centrally shaped with a bowl shape that limits the ends of the rotor coil that are adjacent to the walls;
- the heat conducting material is not magnetic and advantageously chosen from the group containing "zamac," aluminum, magnesium, in order to reduce the weight of the motor and to facilitate its creation via casting.
- variably, the material is magnetic or magnetizable, such as steel;
- one of the two pieces of the frame is a piece with at least one part gear box casing of the actuator to which the said motor corresponds;

- at least one of the two pieces of the frame comprises an end of the wall and an radial orientation portion that contains on the outside elements that contribute to the increase in thermal changes with ambient air;
- at least one of the two pieces of the frame comprises cooling fins;
- at least one of the two pieces of the frame comprises fixation lugs that facilitate the thermal changes via conduction and the dismantling of the piece devoid of the fixation lugs;
- at least one or the other of the two pieces of the frame comprises a wall end and circumferential part;
- the two pieces are in different materials.

Other characteristics and advantages of the invention will be brought out in the following description. This description is purely illustrative and non-limiting. It must be read in regard to the attached drawings on which:
- figure 1 is a schematic cut view illustrating one method of production;
- figure 2 is a schematic cut view illustrating another method of production;
- figure 3 is a perspective view of the production method of figure 2;
- figure 4 is schematic cut view illustrating another method of production of invention;
- figure 5 is a perspective view of the production method of figure 4.

The electric motor that is represented on figure 1 is a closed direct current electric motor, that comprises a hollow frame 1, as well as a coiled rotor 2 carried by a shaft 3 mounting rotating between two bearings 4, 5 mounted in the frame 1, made up of ball bearings in this method of production. The shaft 3 carries between these two bearing 4, 5 a packet of coupled sheet metal 20, each having notches in the shape of a V in order to make up radial grooves 30. These grooves are designed to wrap around several conductor threads, here in copper, in order to form a coil 21. This coil thus has, projecting in relation to the packet 20, and at each of its ends, a first and second radial end, 22 and 23, in the shape of buns.

The frame 1 is a closed frame that is watertight and sealed to dust. It is made up of two pieces 6, 7 that are radially arranged one on the other, their contact and assembly plane being notably perpendicular to the axis of rotation X-X of the shaft 3.

These two pieces 6, 7 are hollow molded pieces in a light non-magnetic material in this method of production, and having good thermal conduction, such as aluminum, magnesium, "zamac", etc. Variably, these hollow are made of machined steel or another magnetic material or magnetizable material and a good heat conductor.

They each have a ring-shaped portion with radial orientation 6a, 7a the interior surface of which is of a cylindrical shape, and a bottom 6b, 7b, with transversal orientation, that ends this portion 6a, 7a at an end. The bottom 6b receives the bearing 4 that makes the rear bearing; the bottom 7b is crossed by the shaft 3 and is prolonged by an overhang 16 that receives the front bearing 5, as well as the manifold 14 of the motor. It also has lodgings 15 for charcoal 15'.

The frame 1 carries a ring inductor 8 and magnets 9. In order to do this, it receives in its interior a tubular ring 8, that is in a magnetic or magnetizable material, for example soft iron.

It also receives permanent bearing 9 that are placed on the interior of the tube 8 and the magnetic field of which surrounds the tube 8. A weak air-gap is placed between the packet of steel 20 and the magnets, allowing the increase of the motor's performance.

The tube 8 and the magnets 9 are held in place via a built-in in the frame by interior holes 10 that have bottoms 6b, 7b and in which the edges of the tube 8 and the bearings 9 are received. This built-in allows, via cooperation, the shapes to free themselves from springs normally used for assembling the bearings of the tube. In addition, the replacement of these springs by the heat conducting material between the holes 10 allows the more efficient removal of the calories because the coil of the conductor thread in the grooves 30 are adjacent to this material that advantageously reaches radially from one bottom 6b to the other 7b.

The bottoms 6b, 7b, each transversally making up an end wall for the piece 6, 7, respectively, also having an interior with a bowl shape that envelopes the radial ends 22, 23 of the coil 21 of the rotor 2. These ends 21, 22 are according to the invention, continually adjacent to the bottoms 6b, 7b, which allows the minimization of the space between these bottoms 6b, 7b and the ends 22, 23. As a consequence,

the radiation energy by the ends 22, 23 is transmitted over the entire frame and removed in an optimized manner.

As one already knows, the structure that was just described allows the use of good heat conducting materials in order to create a sealed frame, specifically to water and dust, of a compact electric motor.

In addition, the bottoms 6b, 7b of the frame, making up end walls, have centrally the shape of a bowl in order to receive in a complementary manner the buns 2, 23 of the coil 21. This arrangement minimizes the distance between the coil and the frame 1, which allows the optimization of the cooling of the inductor by the frame 1.

One will also note that "zamac", aluminum, or magnesium allows a gain of mass.

In addition, the structure described allows the casting of one of the two pieces 6, 7, that make up the frame 1 – and specifically that which defines the front bearing of the motor – in such a way that it is a piece with at least one gear box casing part 16 of the actuator to which the motor is associated. Also, the piece that is cast in one piece with at least one gearbox casing part can be in a different material, with a similar magnetic nature or different in relation to the other piece.

The result is a simplification of mounting, as well as an increase in volume of the frame 1 which contributes to the increase the thermal changes with the ambient air.

In the example illustrated in figure 1, the piece 6 has more than one fixation lug 13 that, other than their mechanical function, also allows the augmentation of the volume of the frame 1 and thus the thermal changes via convection and radiation with the ambient air and via conduction with the support on which the lugs are attached. In addition, the fact that the fixation lugs are placed to the right of the steel packet 20 allows the diminishing the chance of being unbalanced and thus to improve the holding of the rotor 2.

Variably or as a complement, it can also be planned that at least one of the two pieces 6 and 7 carry cooling fins.

This is what is illustrated in figures 2 and 3, on which one has represented a production variance in which the circumferential part 6a of the piece 6 comprises more than one cooling fin 11 that reaches the length of the generators of this part 6a, each in a plane diametrical to the piece 6. More specifically on figure 2, it appears that pieces 6 and 7 are joined via flanges 31, 32 of which one 32 is interrupted by the fixation lugs 13. The flanges are assembled together via fixation systems, such as screws, rivets or others known to those in this profession.

Other production variations of the invention are also very possible. For example, the two pieces of the frame carry fixation lugs and cooling fins. Each piece can contain at least one fixation lug interrupting the corresponding flange.

These two pieces can have different thicknesses as a result of the applications designed. Specifically, as is illustrated on figures 4 and 5, the piece 7 can be made up of one simple closing plate on which comes to relate to the hollow part 6.

Also, the plate carries charcoal (not represented on figures 1 to 5) can be placed on the interior of the frame 1 on the bottom 7b of the piece 7. The calories freed by the plate are also directly removed by the piece 7.

The shaft 3 has an end fitted in order to allow the creation of the input element of the actuator. For example, as is illustrated in a schematic manner on figure 4, the shaft 3 has a threaded end 33 in order to guide a nut or a wheel belonging to a engaging device, such as is described in documents EP 0 740 401 and EP 0 897 629.

However, in order to obtain thermal changes even more efficient between the inductor and the rest of the motor, specifically while the conductor thread is of a bigger diameter so that the motor can furnish a larger couple motor, it is advantageous that the coils and the buns are nearer to the frame. In order to do this, without de-standardizing the notches of the steel packet, the bottoms of the notches are filled with a plastic material, or any other electrically and thermally isolating material, so that the thread coils occupy all of the space in the top of the grooves and thus radiation towards the frame and/or the ring. Variably, it is also possible to produce specific notches less deep.

CLAIMS

1. Electric motor, notably for the actuator of the motor vehicle, comprising a rotor (2) provided with a coil (21), having a first (22) and second (23) radial ends, and mounted rotating in a hollow frame (1) comprising two parts (6, 7) directly mounted on each other and having end walls (6b, 7b), two parts being made of good heat conducting material and said frame bearing induction means (8, 9), characterized by in that said frame (1) is sealed, and the two parts are two components (6, 7) transversally assembled one on each other, and the end wall (6b, 7b) of each part is continuously adjacent to one of said first and second ends (22, 23) of the coil (21).

2. Motor according to claim 1, characterized by the end walls (6b, 7b) enveloping nearer the ends of the coil (21) in the shape of buns.

3. Motor according to claim 2, characterized by the end walls (6b, 7b) of the two pieces (6, 7) are centrally *bowl shaped.

4. Motor according to one of the preceding claims, characterized by the material being non-magnetic and chosen in the group comprising "zamac", aluminum, magnesium.

5. Motor according to claims 1 to 3, characterized by the material being magnetic or magnetizable, such as steel.

6. Motor according to one of the preceding claims, characterized by one (7) of the two pieces of the frame (1) is made up of one piece with at least one part of a piece of gear box casing of the actuator to which the said motor corresponds.

7. Motor according to one of the preceding claims, characterized by at least one (6) of the two pieces (6, 7) of the frame (1) comprising an end wall (6b) and a radial orientation portion (6a) that contains on its exterior elements (11, 13) that contribute to the increase of the thermal changes with the ambient air.

8. Motor according to claim 7, characterized by the radial orientation portion (6a) carrying the cooling fins (11).

9. Motor according to one of claims 6 and 7, characterized by the said portion (6a) carrying fixation

lugs (13).

10. Motor according to one of the preceding claims, characterized by both of the two pieces (6, 7) of

the frame (1) comprising an end wall (6b, 7b) and a radial orientation portion (6a, 7a).

11. Motor according to any of the preceding claims, characterized by each piece (6, 7) having an assembly flange of pieces between them.

12. Motor according to claim 11 taken in combination with claim 9, characterized by at least one of the flanges is interrupted by at least a fixation lug (13).

13. Motor according to one of claims 1 to 12, characterized by one (7) of the two pieces of the frame (1) being a closing plate on which the other piece is attached.

14. Motor according to one of the preceding claims, characterized by comprising a plate carrying charcoal placed at the interior of the frame on the end wall of one of the two pieces.

15. Motor according to any of the preceding claims, characterized by the two pieces being in different materials.

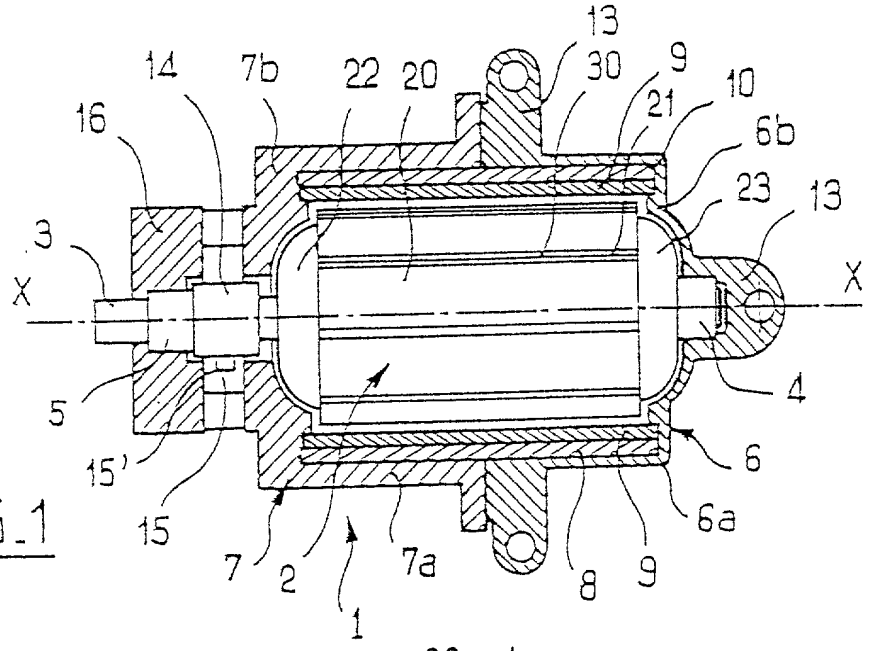

FIG_1

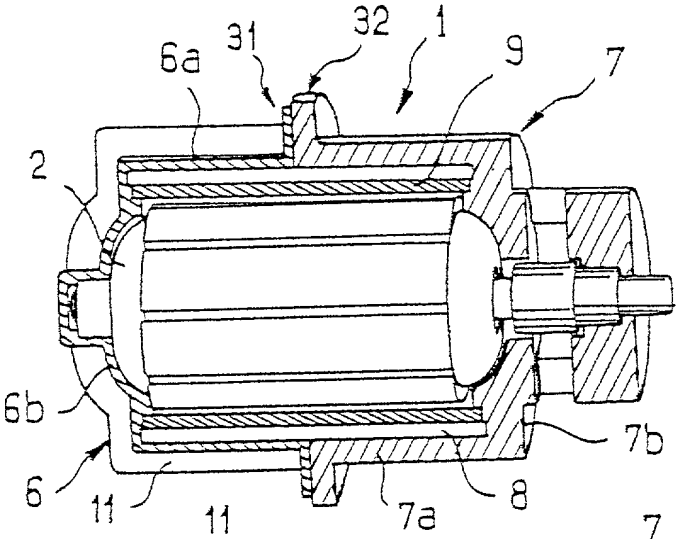

FIG_2

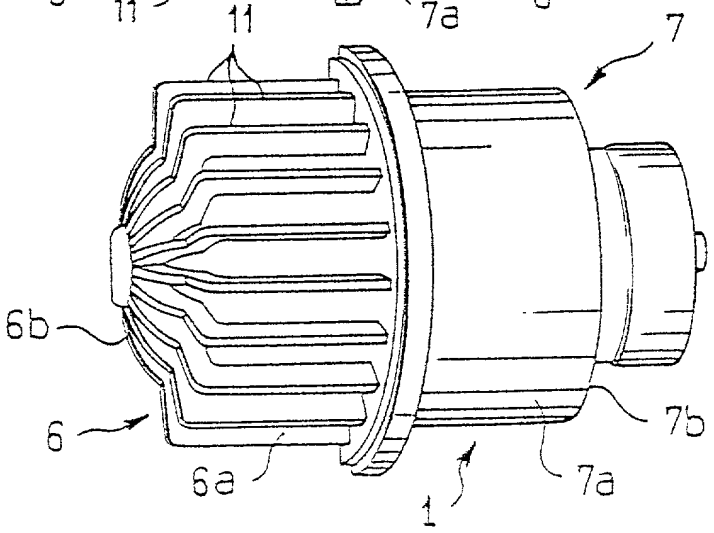

FIG_3

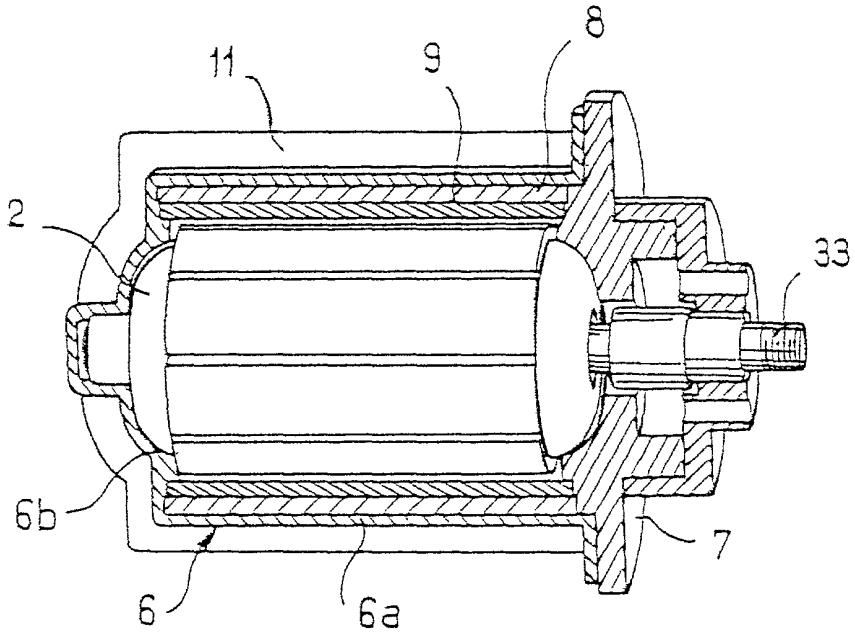

FIG_4

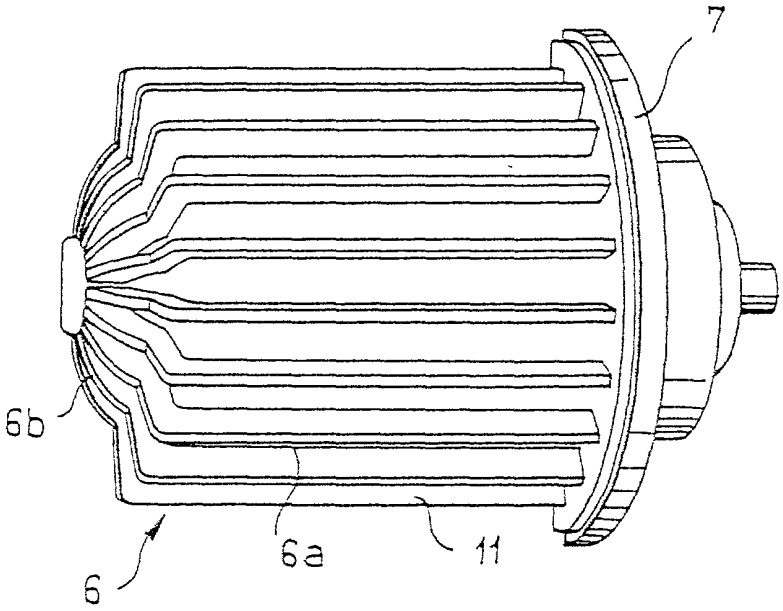

FIG_5

Our Reference: VMF-493-A (MF0181)

COMBINED DECLARATION AND POWER OF ATTORNEY

DECLARATION:

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

IMPROVEMENTS TO DIRECT CURRENT ELECTRIC MOTORS, IN PARTICULAR FOR MOTOR VEHICLE ACTUATORS

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application Serial No. _____ on _____, and was amended on or through _____(if applicable).

[X] was filed as PCT international application Number PCT/FR00/00269 on 04 February 2000, and was amended under PCT Article 19 on _____(if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate or §365(a) of any PCT international application(s) which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT international application(s) having a filing date before that of the application on which priority is claimed:

Prior Foreign/PCT Application(s) and any Priority Claims Under 35 U.S.C. §119:			Priority Claimed	
99/01358	France	05 February 1999	[X]	[ ]
(Number)	(Country)	(Day/Mo/Yr Filed)	Yes	No
			[ ]	[ ]
(Number)	(Country)	(Day/Mo/Yr Filed)	Yes	No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

(Application Number) (Filing Date)

(Application Number) (Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or §365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Prior U. S. Application(s) or PCT International Application(s) Designating the U.S. for Benefit Under 35 U.S.C. §120:

(Application Number)	(Filing Date)	(Status: patented, pending, abandoned)
(Application Number)	(Filing Date)	(Status: patented, pending, abandoned)

(4)

POWER OF ATTORNEY:

I hereby appoint the following attorney(s) and/or agent(s) J. Gordon Lewis, Patent Office Registration No. 28735, Andrew R. Basile, Patent Office Registration No. 24753, William M. Hanlon, Jr., Patent Office Registration No. 28422, and Thomas D. Helmholdt, Patent Office Registration No. 33181, as my attorney(s) and/or agent(s), to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith.

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Troy, Michigan 48084
Phone: (248) 649-3333

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-00

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